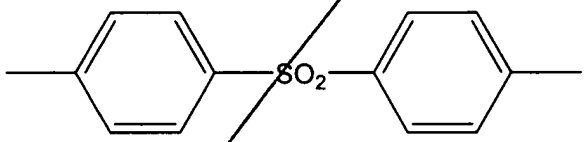
an endless belt which is obtainable continuously by melt extrusion from a circular die;

said endless belt comprising a layer containing a thermoplastic resin having a diphenyl sulfone structure represented by the following Formula (1)



(1)

the endless belt having a thickness not larger than 1/3 of the slit-width of the circular die used and having an external diameter of from 105% to 400% of the external diameter of the die slit of the circular die used, wherein an extrusion material has a breaking extension of 2% or more and a tensile breaking strength of 40 MPa or more.

REMARKS

The claims are 1-3, 5, 9-13 and 30, with claims 1 and 30 being independent. Claims 8, 14-16 and 21-27 have been cancelled. Claims 1 and 30 have been amended to include the features of cancelled claim 8. No new matter has been added. Reconsideration of the present claims is expressly requested.

Claims 1-3, 5, 8-13 and 30 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 5,525,446 (Sypula) in view of JP 4-255332 (Mitsubishi). This rejection is respectfully traversed.

Prior to addressing the merits of the rejection, Applicants would like again to briefly point out some of the key features and advantages of the presently claimed

invention. The present invention is directed to an endless belt formed by the so-called blown-film extrusion (inflation) in which the belt has an external diameter from 105% to 400% of the external diameter of the die slit. When the extrusion method yielding such an increase in the external diameter is employed, the strength of the belt tends to be unpredictable due to the change in the resin orientation.

The present invention employs an extrusion method to easily produce a resin film with a thickness as little as 1/3 of the slit width while having a considerably large external diameter as mentioned above. These relative proportions, however, tend to result in a disadvantageously uneven film thickness and an increased stress on the resin, which adversely affects the belt's durability.

The present invention solves the above technical problems particular to this extrusion method by the use of the specific extrusion material that contains a resin having a specific structure with specific physical properties. Only when all of the physical requirements are satisfied, can an endless belt be obtained that has excellent properties and does not suffer from the drawbacks associated with the extrusion method.

Sypula is directed to a method of producing an endless belt using a circular die. This reference states that "polysulfone" and "polyethersulfone" are suitable resins. However, Sypula does not disclose or suggest any specifics regarding the physical properties of the extrusion material as defined in the present claims.

These physical properties may depend not only on the kind and molecular weight of a resin used, but also on the nature, amount and dispersion state of conductive particles. Applicants respectfully submit even when a resin in Sypula bears the same name

as the resin in the subject application, a skilled artisan would readily understand that these resin do not necessarily have the same physical properties depending upon a variation in their molecular weights or the amount of the additive used. Accordingly, it would not be possible to glean the physical properties of the extrusion material in Sypula only from the mere names "polysulfone" and "polyethersulfone". Thus, clearly, Applicants have shown that this reference does not disclose or suggest the physical properties of the resin as presently claimed.

Further, Sypula does not disclose or suggest any dimensional relationships in connection with the external diameter of the endless belt and the die slit and does not provide any examples of using the inflation extrusion forming method. As mentioned above, if the extrusion method yielding an increase in the external diameter as presently claimed is used, the strength of the belt tends to be unpredictable due to the change in the resin orientation.

The Examiner has alleged that "[i]t would have been obvious to one of ordinary skill in the art to optimize the belt because discovering optimum or workable ranges involves only routine skill in the art". Applicants respectfully disagree.

"A particular parameter must first be recognized as a result-effective variable . . . before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." M.P.E.P. § 2144.05 (emphasis added). This recognition must be found in the art and not in Applicants' disclosure. As mentioned above, Sypula is silent with regard to the result-effectiveness of the variables the Examiner has alleged to be optimizable. Thus, as a matter of law, there is no required recognition to apply the optimization principle.

In addition, Applicants would like to reiterate that while Sypula does list a diphenyl sulfone as a possible resin, it does not disclose or suggest that this resin is specifically suitable for the melt-extruded belt sized as in the present invention or provide one iota of disclosure regarding this type of compounds being superior to others in a long list of compounds that it provides (col. 2, line 57 - col. 3, line 15; col. 5, lines 35-57). In fact, at col. 5, line 44, Sypula mentions that polyethylene may be used as a suitable thermoplastic resin. Comparative Example 1 in the subject application clearly shows that this material, which also has a tensile breaking strength outside the presently claimed range, results in a belt that has insufficient strength and durability. Thus, Sypula cannot affect the patentability of the present invention.

Mitsubishi cannot cure the deficiencies of Sypula. This reference discloses that a circular die is used to produce an endless belt using an extrusion method. However, like Sypula, Mitsubishi also does not contain any teaching regarding the physical properties of the extrusion material as presently claimed. Thus, as discussed above with respect to Sypula, it would not be possible to glean the physical properties of the extrusion material only from the mere names "polysulfone" and "polyethersulfone".

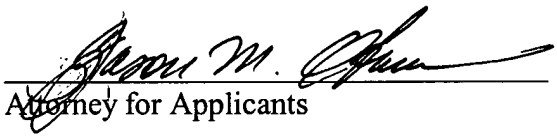
Moreover, the Examiner will note that endless belt in Mitsubishi has an external diameter smaller than that of the die slit. Also, while this reference discloses polysulfone and polyethersulfone as examples of usable resins, these resins are genuses comprising thousands of possible compounds of which diphenyl sulfones are only a minute fraction. Applicants do not understand Mitsubishi to specifically disclose diphenyl sulfones or to teach or suggest that these compounds are suitable for the present invention.

comprising thousands of possible compounds of which diphenyl sulfones are only a minute fraction. Applicants do not understand Mitsubishi to specifically disclose diphenyl sulfones or to teach or suggest that these compounds are suitable for the present invention. Mitsubishi is not understood to teach or suggest that an overwhelming majority of compounds it discloses would not result in a strong and durable endless belt sized as in the present invention or that even suitable materials must have specific physical characteristics. Accordingly, Mitsubishi, whether considered separately or in combination with Sypula, is legally insufficient to affect the patentability of the present invention.

Wherefore, Applicants respectfully request that the rejection be withdrawn and the present case be passed to issue.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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APPENDIX

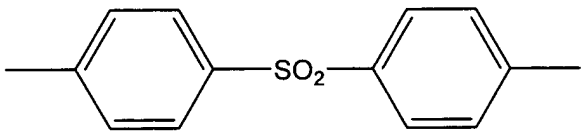
Application No. 09/467,986
Attorney Docket No. 03500.014120

IN THE CLAIMS:

Claims 8, 14-16, 18 and 21-27 have been cancelled.

Claims 1 and 30 have been amended as follows:

1. (Three Times Amended) An endless belt for electrophotography which is obtainable continuously by melt extrusion from a circular die; the endless belt comprising a layer containing a thermoplastic resin having a diphenyl sulfone structure represented by the following Formula (1)



(1)

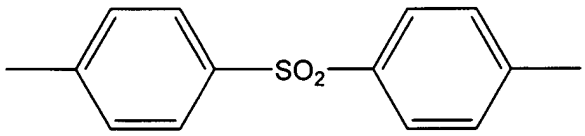
the endless belt having a thickness not larger than 1/3 of the slit-width of the circular die used and having an external diameter of from 105% [more than 100% but less than or equal] to 400% of the external diameter of the die slit of the circular die used, wherein an extrusion material has a breaking extension of 2% or more and a tensile breaking strength of 40 MPa or more.

30. (Three Times Amended) An image forming apparatus for electrophotography comprising:

an endless belt which is obtainable continuously by melt extrusion

from a circular die;

said endless belt comprising a layer containing a thermoplastic resin having a diphenyl sulfone structure represented by the following Formula (1)



(1)

the endless belt having a thickness not larger than 1/3 of the slit-width of the circular die used and having an external diameter of from 105% [more than 100% but less than or equal] to 400% of the external diameter of the die slit of the circular die used, wherein an extrusion material has a breaking extension of 2% or more and a tensile breaking strength of 40 MPa or more.